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## Microwave Energy Detector & Wireless Energy Harvesting

By [tbudka \(/member/tbudka/\)](/member/tbudka/) in [Technology \(/technology/\)](/technology/) > [Electronics \(/technology/electronics/\)](/technology/electronics/)

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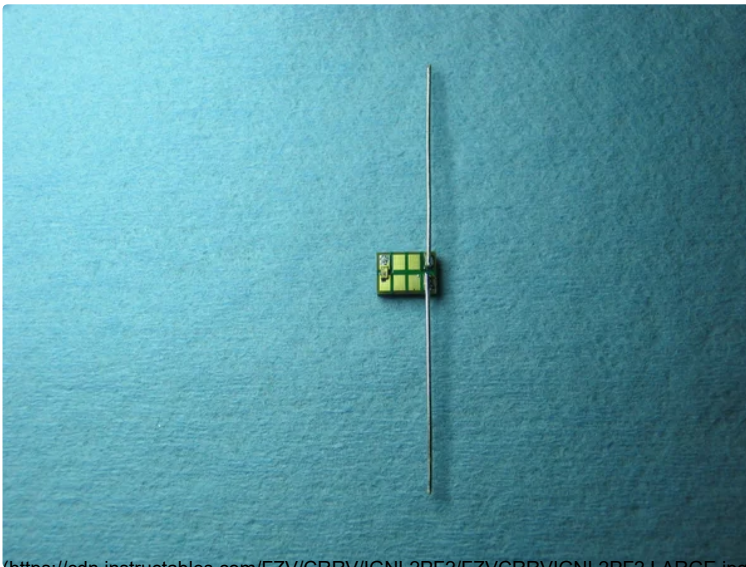
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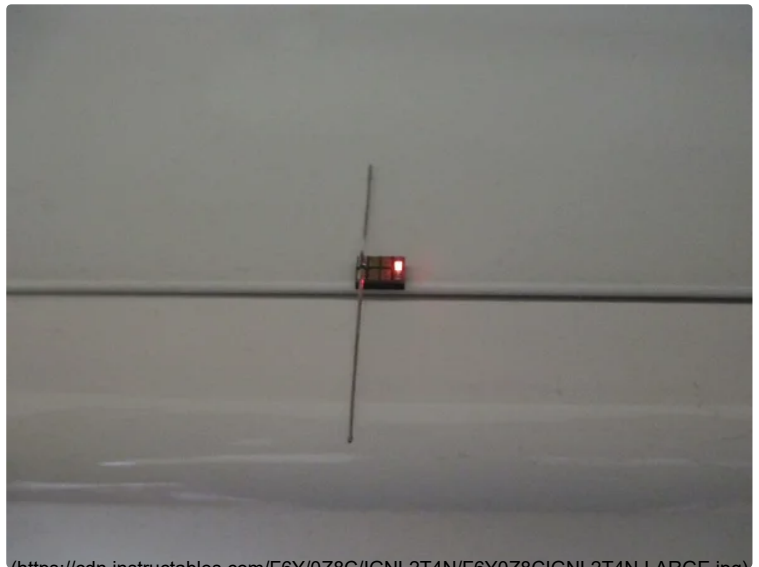


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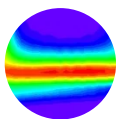
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By **tbudka**

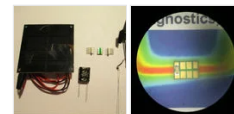
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RF Diagnostics, LLC

(<http://www.rfdiagnostics.com>)

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### Description

This article describes how to build a wireless harvesting device that will capture stray 2.5GHz energy from a microwave oven and convert it into a useable voltage that will light up a red light emitting diode (LED). Hobbyists can modify the antenna with longer wires and try to pick up other signals such as AM/FM radio, mobile phone signals and other

wireless energy. The LED's light will be visible when the module picks up 1 milliwatt-10 milliwatts of microwave power. Usually the most power leaks out of the door seam of a microwave oven.

### What you need:

1 RFD102A (RF-DC Converter) module available at

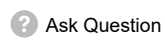
<http://www.rfdiagnostics.com/product/rfd102a/>

1 ¼ watt leaded resistor (any value) or two wires that are 1 1/8 inches long (28.6mm)

1 Kingbright Surface mount red LED (part number: APT1608EC) available at  
Digikey/Mouser/Newark

Fine tipped soldering iron

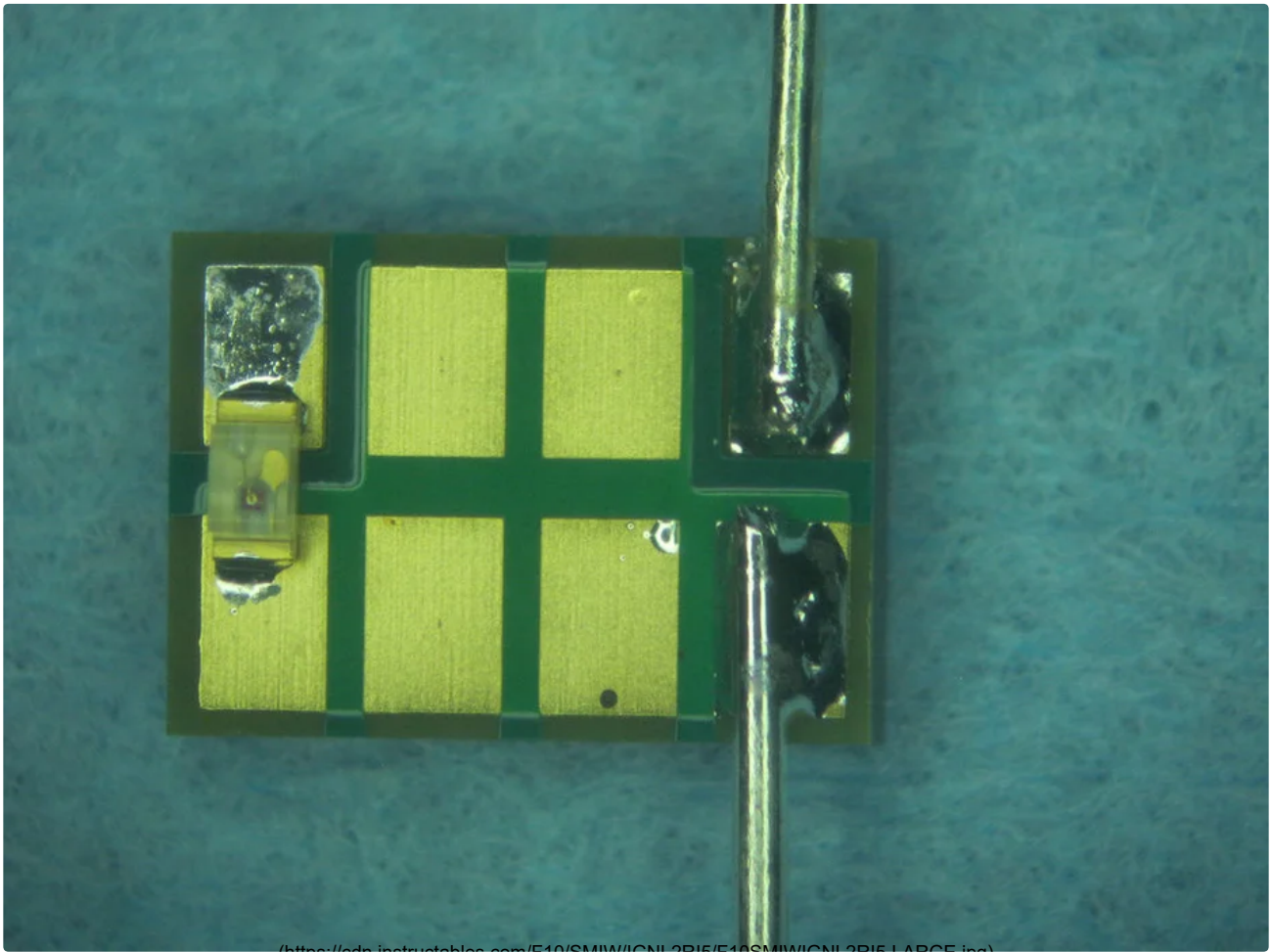
Solder paste or Fine Solder



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## Step 1: Assembly Instructions




Cut the resistor wires off next to the resistor. These are just the right size at 1 1/8" long for a 2.5GHz dipole. Throw away the resistor and keep the wires.

Put solder paste on the module at pins 1 & 8 and at pins 4 and 5. Place the wires on pins 4 and 5 and solder carefully using tweezers to hold the wires (it will burn you otherwise). Solder at the lowest soldering temperature possible to avoid damaging the module. If the iron is too hot then you may damage the internal connections inside the module. Use a minimum of time for soldering (<10secs). The wires work as a dipole antenna to collect the 2.5GHz energy into the RF (Radio Frequency) Input of the module.

Place the LED with the anode (positive side) onto pin 1 and the cathode (negative side) on pin 8 and solder carefully. For those not familiar with LEDs, the triangle symbol of the diode should point to the ground pin of the module (pin 8). Your final microwave harvester should look like figure 2

 Add Tip

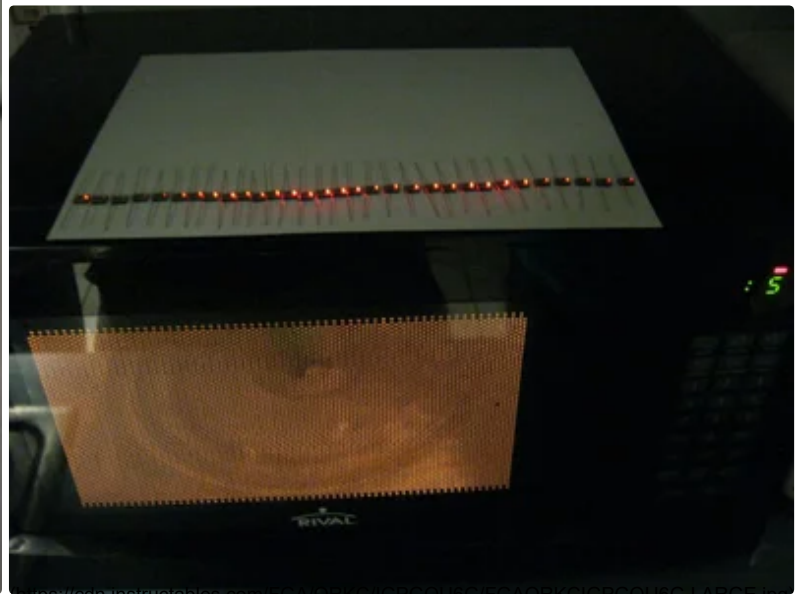
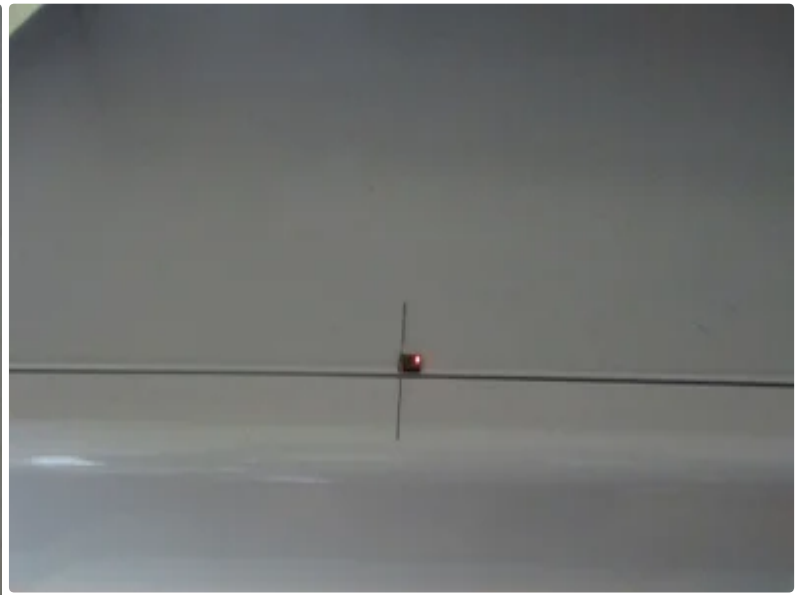
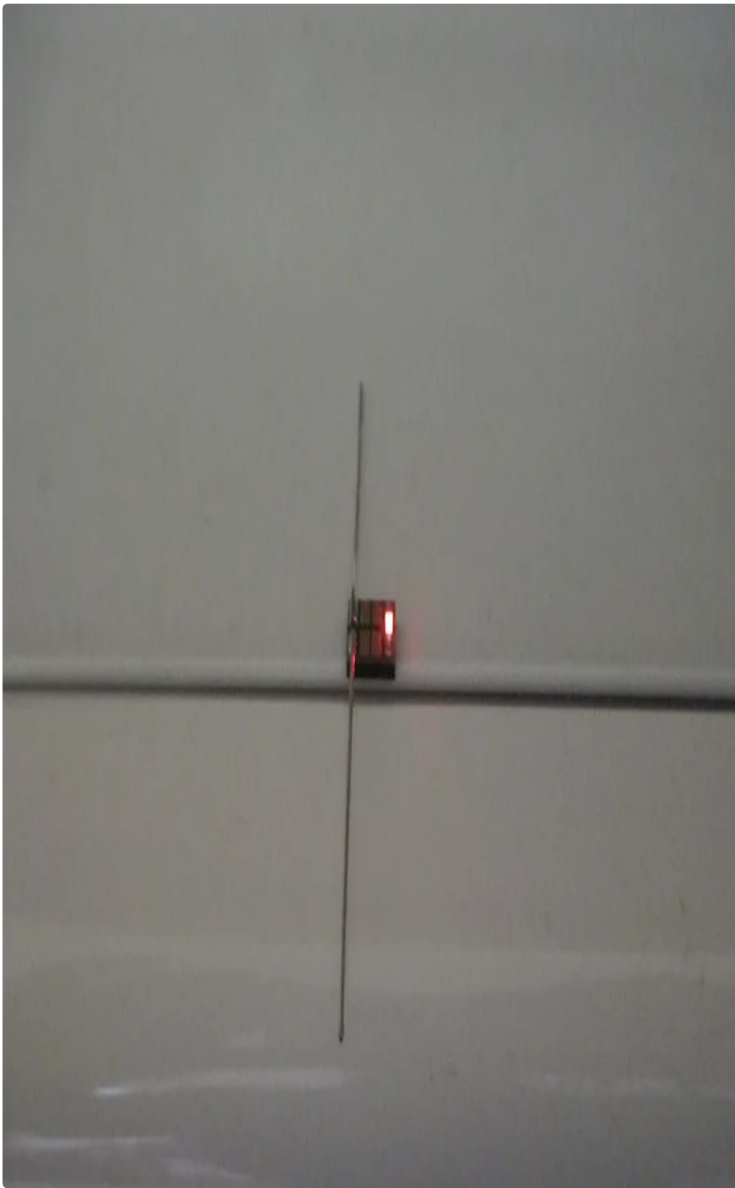
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## Step 2: Test on Your Microwave Oven



Now put some water in a mug and put it in the microwave oven and cook on high for 2 minutes. While the microwave is running, hold the module and move the module antenna around to find a hot spot on the microwave. Tape the module on the ground wire to the microwave to keep it in place. If all is well then you will see the LED light up and dim as the electric fields change while the mug rotates in the microwave oven. The above figures show the microwave energy harvester in action. Experiment with antenna shapes and sizes. If you go too big or too small with the antenna then less energy will be collected. You can also put the assembled module near an 802.11b/g/n wireless LAN router and watch it flicker as the router transmits and receives 2.4-2.5GHz energy. Enjoy!

Other Project Ideas:

- Harvest AM/FM Radio Signals

FAQ

- What is the maximum current this module can provide? Ans: Typical current is ~0.5-5mA. Max current is 18mA.

- What is the efficiency of converting RF energy to a DC voltage? Ans: If the input power to the module is around 10-50mW then the RFD102A can achieve >50% efficiency if the resistance seen by the DC output is ~10kOhm.

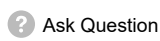
- I don't have a soldering iron and am all thumbs. Where can I get a detector like this already built up? Ans. The RFD102A-DET is available  
<http://www.rfdiagnostics.com/product/microwave-oven-window-energy-harvesting-kit/>

- What is the maximum output voltage this module can produce? Ans: With 0.5W input power the module can produce up to 37V at 915MHz.

- Can I charge my mobile phone with this? Ans: It is possible with 4 RFD102A modules and antennas to produce enough current to charge a mobile phone. The hard part is the wireless source would need to be so powerful that you wouldn't want to be in the same room during charging. You may hurt your eyes by cooking them.



Add Tip

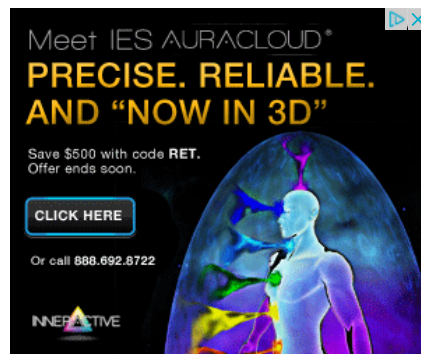


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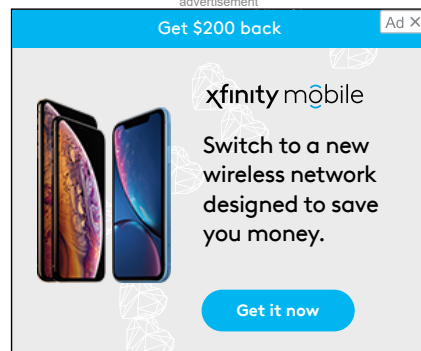


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